SECTION III.—FORECASTS.

STORMS AND WARNINGS FOR SEPTEMBER.

By EDWARD H. BOWIE, District Forecaster.

[Dated, Washington, Oct. 10, 1914.]

At the beginning of the month pressure was high over the western Atlantic Ocean as indicated by reports from the Bermudas and over Montana, while low pressure prevailed over the Grand Banks and from the southern Plains States to the upper Lake region, the main center, however, being over Lake Michigan. Showers were in progress in the upper Mississippi Valley and the upper Lake region. The low center indicated above moved northeastward during the two days following and was immediately followed by another low pressure area from the Canadian Northwest, which passed along the northern border to the upper St. Lawrence Valley by the 4th. Precipitation occurred generally from the Plains States eastward over the Northern States. In connection with the disturbance last mentioned, fresh winds occurred over Lakes Huron and Erie, for which small craft warnings had been previously issued.

The Montana high area moved eastward and was central off the South Atlantic coast by the morning of the 7th.

Pressure became low over the Northwest on the 3d, and a low moved eastward along the northern border. A secondary development which appeared in the trough of this storm was on the morning of the 6th over northern Lake Michigan, and small craft warnings were ordered. During the next two days this disturbance passed to the Canadian Maritime Provinces. Showers and thunderstorms attended its passage in the upper Mississippi Valley, Ohio Valley, the Lake region, and New England.

A recovery from this depression set in over the Canadian Northwest, and a high center was over Manitoba on the evening of the 6th, moving thence eastward to the St. Lawrence Valley by the 11th. It was reenforced on the following day by a high pressure area that first made its appearance on the North Pacific coast on the 8th. This high persisted over the lower St. Lawrence Valley and northern New York State until the 17th, when another high area appeared over western Ontario. On the morning of the 18th there was one center over eastern Ontario, whence it settled southward to the South Atlantic coast by the 22d.

During the 6th pressure decreased over British Columbia and the northern plateau region, and by the following morning a trough of low pressure extended from British Columbia to Colorado. It advanced slowly eastward during the next 48 hours, and on the morning of the 9th the trough extended from Saskatchewan southward through eastern Colorado. The northern part of the disturbance remained nearly stationary for several days, while a secondary of weak proportions developed over eastern Colorado and moved eastward to West Virginia by the evening of the 11th, causing showers over the middle tier of States between the Rocky and Appalachian Ranges. Several other secondaries developed over the Plateau and southern Rocky Mountain regions, but owing to the abnormal development and extent of the high pressure area in the East were unable to find a passage eastward; showers and thunderstorms occurred, however, with great persistency over the Plains States. Pressure continued low over the Northwest until the 16th.

On the morning of the 15th reports received from the vicinity of the Bahamas indicated the inception of a disturbance over that region. Pressure falls of 0.18 inch and 0.10 inch were reported from Nassau and Turks Island, respectively, and the following message was disseminated to shipping:

Strong indications of a disturbance in vicinity of Bahama Islands; direction of movement unknown. Strong northeast winds, probably increasing off South Atlantic coast.

On the evening of the 15th the following notice was issued and northwest storms warnings ordered displayed on the eastern coast of Florida and northeast warnings from Jacksonville to Hatteras.

Disturbance off east Florida coast and apparently moving north or northwestward. Strong northerly winds off South Atlantic coast. Advise ships to exercise caution.

The storm on the morning of the 16th was off the eastern coast of Florida and on the evening of that date off the southern Georgia coast. Instead of passing northward up the coast, as is customary with disturbances of this character, it advanced westward over southern Georgia and continued its progress westward to the Texas coast, where it disintegrated. This disturbance caused winds of gale force along the south Atlantic coast, and vessel reports indicate that it was even more severe off the Georgia coast. After reaching the land the storm decreased in intensity and caused general rains in the South Atlantic and Gulf States.

A low center was central on the North Pacific coast on the 18th, which during the next two days advanced slowly eastward in the form of a trough, extending on the morning of the 20th from Manitoba to Arizona. It continued to move slowly eastward, being central over the Mississippi Valley on the 22d and over Atlantic coast districts on the 25th. In the extreme southern end of this trough a secondary developed, which, passing east-northeastward from the southeastern Texas coast, was central on the 24th off the Alabama coast. On the previous afternoon storm warnings were issued on the Gulf coast from Pensacola to Galveston. On the evening of the 24th warnings were ordered from Jacksonville to Hatteras. The storm passed to the South Atlantic coast by the morning of the 25th, and thence north-northeastward to a position off Nantucket by the following morning. On the 26th it was near Newfoundland with greatly increased intensity, a reading of 29.28 inches being reported at St. Johns. Precipitation occurred quite generally throughout the country, except in the Southwest.

An extension from the subpermanent high-pressure area of the North Pacific Ocean appeared over Idaho on the morning of the 21st. It moved thence slowly eastward to the southern Plains States during the following 24 hours. During the 24th it was reenforced by another high pressure area from the Canadian Northwest, which was central on

the evening of the 24th over Minnesota. It passed thence southeastward to West Virginia by the 27th, when another high area was central over eastern Lake Superior. This latter became the main high and passed thence southeastward to the south Atlantic States by the evening of the 29th. Frosts occurred quite generally in connection with these two highs over the upper Mississippi Valley, the Lake region, the northern portion of the Ohio Valley, and the Middle Atlantic, and New England States, warnings being successfully issued in the majority of cases. On the morning of the 29th low temperature records for the month of September were broken at three stations in Atlantic Coast States. Another offshoot from the Pacific high area was central on the north Pacific coast on the evening of the 27th, and moved thence eastward to the northern upper Lake region by the end of the month.

A low-pressure area that was over western Alberta on the 26th moved eastward along the northern border and was central at the last of the month off the New England coast. Very little precipitation attended its passage.

NORTHERN HEMISPHERE PRESSURE.

Alaska.—Pressure averaged decidedly above normal over the Aleutian Islands and slightly above normal over Bering Sea, as indicated by reports from Nome. Over southeastern Alaska pressure averaged below normal, while elsewhere pressure was about the seasonal average. Lows occurred about the 4th, 9th, 12th–13th, 21st, 25th–26th, and 28th; and highs about the 1st, 6th, 11th, 14th, 17th–18th, 24th, and 29th–30th. The most pronounced high of the month occurred about the 15th.

Honolulu.—Pressure averaged below normal, being almost continuously below from the 1st to the 26th and above from that time until the end of the month.

Horta.—Pressure averaged slightly above the normal. Lows occurred on the 2d–3d, 5th–6th, 17th, 23d–24th, and 27th–28th; and highs on the 1st, 8th–14th, and 19th–22d, the most important being the one that crested on the 12th.

FORECAST DISTRIBUTION.

By GEORGE W. SMITH.

[Dated, Forecast Division, Weather Bureau, Sept. 1, 1914.]

The daily distribution of weather forecasts by the Weather Bureau, Department of Agriculture, has attained such success, the forecasts and warnings are so popular and affect all affairs to such an extent, that a paper contrasting the small beginnings of this service with its present condition must prove interesting to a large number of readers. Mention of "cautionary" or storm signals and also of the Daily Weather Map will be made, but only in a casual way, as these should receive the separate consideration that their importance merits.

Storm studies had been begun by James P. Espy, who was appointed "Government meteorologist" in 1840. Espy died in 1860, but his work was continued by the Smithsonian Institution and later by the Cincinnati Observatory until 1870. The official collection of meteorological reports by telegraph was begun by the Signal Corps of the United States Army, under the Chief Signal Officer, Gen. Albert J. Myer, by authority of Congress, see "Public Resolution No. 9," approved February 9, 1870.

The first reports and bulletins of the Signal Office were for November 1, 1870, 7:35 a. m., 4:35 p. m., and 11:35 p. m., Washington time, at 24 selected stations of observation. The reports received from these stations were prepared in the form of tabulated bulletins, and these were given to the "press" three times a day at 10 a. m., 7 p. m., and 1 a. m., respectively. These reports were promptly plotted at Chicago, Ill., by Prof. I. A. Lapham, of Milwaukee, Wis., on charts for the purpose of studying the probable occurrence of storms on the Great Lakes. The first notice of an expected storm was sent by Prof. Lapham to Gen. Myer, and telegraphed by the latter officially from the central office at Washington, D. C., on November 8, 1870. It was telegraphed to several stations along the Lakes and bulletined for the benefit of shipping interests there.

These bulletins of the weather conditions early attracted considerable attention, and those particularly interested made a strong demand that "deductions" from the collected reports be made and published.

On January 3, 1871, the services of Prof. Cleveland Abbe, then of the Cincinnati Observatory, were secured, and since that date he has been continuously identified with the weather service of the United States. The compilation of maps, "synopses," and "probabilities" was begun by him at once. The former showed the weather conditions at the hours of observation, and the latter showed deductions made from the telegraphic reports as to probable weather conditions for the ensuing eight hours.

The first published forecasts of the weather were issued on February 19, 1871; these received commendation at first, but afterwards severe criticism because the public expected unreasonable verification of the predictions. As the public became better acquainted with published "probabilities" it demanded that reporting stations be established in the interior of the country at points not previously represented and that predictions be made for the interior sections of the country, and for the benefit of river navigation and the agricultural interests. Accordingly, under an act of Congress approved June 20, 1872, the Secretary of War was directed to provide such stations, signals, and reports as might be found necessary for the benefit of agricultural and commercial interests throughout the United States. This considerably extended the scope of the work of the service.

Up to May 1, 1871, the maps and bulletins were prepared by manifold process, but on that date successful lithographic printing of the maps was begun. This lithographed weather map was favorably received and even became popular; before long it led to the publication, under the direction of the central office at Washington, D. C., of similar charts at New York, N. Y., Philadelphia, Pa., Cincinnati, Ohio, Chicago, Ill., and New Orleans, La. The press bulletins were also prepared three times a day, and contained, first, the "synopses"; second, the "probabilities"; third, the "special storm warnings" when ordered. The number of weather maps and tabular bulletins issued at Washington, D. C., in 1871 averaged 35 of the former and 60 of the latter, daily.

The "synopses" and "probabilities" were given to the public as promptly as possible. The contents of the bulletin were telegraphed to the several stations and there posted. Arrangements were made for the display of "cautionary" or storm signals at 24 stations. These stations have been gradually multiplied until they number 369 at present [1914]. A signal flag was early adopted to indicate "cautionary" or storm warnings. It was a square red flag with a square black center (see fig. 13),